Indoor Air Quality and the Function of Fresh Air Supplies and Exhaust Vents in Schools, Part II

Michael Feeney, R.Ph., J.D., C.H.O.
Chief, Emergency Response/Indoor Air Quality
Bureau of Environmental Health Assessment
MA Dept. of Public Health

This article is the second part of a series that explain how a building's indoor air quality can be affected by ventilation systems. This second installment denotes conditions that can be seen within or around a classroom univent that are signs of a lack of attention to maintenance of this equipment.

In the previous installment of this series, the function of univents and exhaust ventilation was described. Under optimum conditions, the univent and exhaust ventilation create airflow in a classroom. By functioning properly, a univent providing fresh air and the exhaust vent removing stale air and pollutants can both maintain comfort within a classroom. If these systems are not functioning as designed, environmental pollutants can build up and cause symptoms.

The cause of degradation of univent function can be attributed to lack of maintenance in the room or of the univent itself. The following are signs that the univent system is not operating as designed. Each of these conditions were noted by Bureau of Environmental Health Assessment personnel during indoor air quality assessments in Massachusetts schools.

- Accumulation of dust on the return intake vent.
- Heavy deposits of dust on the univent filter. This can be a sign that the univent filter is not changed on a routine basis.
- Accumulation of debris inside the univent above the fan units. Accumulation of crayons, paper, food, and other debris can be a sign that univents are not routinely cleaned.
- Storage of books, boxes, paper or other materials on top of the univent. Storage of materials which block airflow prevents the univent from functioning.
- Production of air from the univent at or near outdoor air temperature. This can be a sign that the fresh air damper may be frozen open, allowing outdoor air to be preferentially drawn into the univent. This condition may result in pipes bursting due to heating coils freezing.
- Production of excessive heated air from the univent. This can be a sign the fresh air damper is closed, preventing fresh are from mixing and tempering return air temperature.
- Controls within the univent fail to activate univent motors. This can indicate that univent motors are disabled or univent controls are disconnected.
- The room temperature does not match temperature setting on the thermostat. This can indicate that thermostats are disabled and are not controlling the activation of the classroom univent.

- Missing vanes or substitute covers over the univent air diffuser. Failing to fix vanes in univent air diffusers can allow for materials to fall into the univent and damage the motors. In some case, damaged diffusers have been seen to be replaced with plexiglass or sheet metal drilled with small holes. By replacing damaged air diffusers with substitutes that do not allow airflow equal to the original diffusers degrade the function of univents.

- Leaves and other plant debris in the space above the filter rack can indicate filters were not have installed. The presence of plant debris above the filter rack also indicates that the interior of univents were not routinely cleaned.

- Signs of animal wastes within the univent casing can be a sign of nesting of pests.

- Upon activating heat only univents, a stale or mold odor is produced from the machine. If the univent provides only heat, this can a sign of rain water penetration into the unit through outside brickwork or window systems. Water stains in the base of the univent casing can be a sign of water pooling and potential mold growth medium.

- If the univent is also provides cooling during the summer months and produces a mold odor, this can indicate inadequate draining of condensate from cooling coils or chilled water supply pipes. Failure to pitch the drain pan in a univent to drain condensate can lead to pooling water and subsequent mold growth. Uninsulated chilled water pipes outside the cooling coil chamber can result in dripping, undrained condensate and subsequent mold growth in wetted materials. Green colored corrosion on copper pipes or rust on steel electric components can be a sign of condensation in univents.

- Frayed or damaged fiberglass insulation within the heating coil chamber. Degrading fiberglass can indicate water damage. Degraded fiberglass insulation can also be aerosolized by univent fans.

- Activated univent motors without spinning fans can be a sign of broken or slipping fan belts.

Each of these conditions can lead to the degredation of univent function, which can lead to a decrease in the provision of filtered fresh air into classrooms. Each of these conditions should be examined and repaired or remediated where found.

Part 3 of this series will describe how the exhaust ventilation system can malfunction through misunderstanding of function by building occupants or through lack of maintenance.

Cory Holmes and Suzan Donahue contributed to this article.